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RELEASE ON RECEIPT

Increased energy levels for megavolt radiation machines used in the treatment of cancer patients at the M.I.T. High Voltage Research Laboratory are being made possible under a $100,000 grant to the Massachusetts Institute of Technology from the Fannie E. Rippel Foundation of Newark, New Jersey.

Announcement of the grant was made by Julius A. Rippel, President of the Foundation, and Howard W. Johnson, President of M.I.T. The Foundation, under an earlier grant, provided support toward construction of the Laboratory's present building, which was completed in 1965.

The High Voltage Research Laboratory, in collaboration with physicians of the Lahey Clinic of Boston, has been using Van de Graaff electrostatic generators to provide two-million-volt X-ray and electron beam radiotherapy for cancer patients since 1949. Over 500 patients now receive treatment with these radiation facilities each year; the total number of individual treatments annually exceeds 10,000.

The Laboratory presently operates a two-million-volt X-ray generator and a three-million-volt electron beam generator. High voltage X-rays are used against deep tumors while electron beams are employed in treating radiation-sensitive lesions on or near the skin.

A portion of the new grant from the Rippel Foundation is being used to acquire the prototype of a newly-developed three-million-volt Van de Graaff X-ray generator. It replaces a second two-million-volt machine which has been in service since 1949. The X-ray output of the new machine, equivalent to the output from more than 15,000 curies of Cobalt 60, will shorten the treatment time and improve the dosage localization possibilities.

The remainder of the grant is being used to acquire high voltage components which, when installed by the Laboratory staff, will raise the voltage level of the present electron beam generator to 5 million volts. This increase in electron beam energy will permit the radiologists and physicists at the Laboratory to apply the electron dosage to deeper levels below the skin.

The M.I.T. staff of the High Voltage Research Laboratory has collaborated with medical centers in the improvement of radiation therapy for over 30 years. With their

- more -

medical associates they have achieved international recognition for the application of high voltage radiation to the treatment of cancer and for innovations in treatment techniques.

Professor John G. Trump, the Director of the Laboratory, studied under and was a long-time associate of the late M.I.T. Professor Robert J. Van de Graaff, who led the development of high voltage electrostatic generators of the type that now bear his name. The medical responsibility for the radiation therapy work at M.I.T. rests with the physicians of the Lahey Clinic. Dr. M. I. Smedal and F. A. Salzman are the radiologists who for many years have carried out the medical aspects of this significant program. Kenneth A. Wright, radiation physicist, is responsible for the physical aspects of the work.

Professor Van de Graaff first achieved high constant voltages in the early 1930's by a novel generator operating under electrostatic principles. In these generators a belt is used to charge a well-insulated terminal to high steady voltages. Van de Graaff generators now insulated in compressed gases have since found wide application in science, industry and medicine. In the medical machines a stream of electrons is accelerated by the high electric field to energies of several millions of volts. Their velocity at this energy is close to the speed of light. The electrons are made to impinge on a metal target to produce high energy X-rays, or they may be allowed to pass through a thin metallic window and used directly for physical or biological purposes.

While radiation therapists use Van de Graaff electron and X-ray beams for medical purposes, physical scientists use Van de Graaff positive ion accelerators as "atom smashers" to probe the structure of atomic nuclei. These nuclear collision experiments were foremost among the purposes of Professor Van de Graaff and his associates in the original development of high voltage electrostatic generators.

It is now well established that megavolt X-rays penetrate more readily to deep tumor locations and reduce adverse effects on the skin and intervening healthy tissue. The use of energetic electrons for direct application to accessible and superficial tumors is more recent and less available. Electrons, the light negatively-charged particles of nature, penetrate only one centimeter into tissue for each 2 million electron-volts of energy.

The first medical X-ray machine developed at M.I.T., a one-million-volt generator insulated in air, was installed at the Huntington Memorial Hospital in Boston in 1937. A second X-ray generator, more compact because of compressed-gas insulation, and operating

- more -

at 1.25 million volts, was placed into service at the Massachusetts General Hospital in 1940 and continued in use there for 16 years.

Van de Graaff X-ray generators of later designs and operating in the range of 2 million volts now are in use at some 40 medical centers in the U.S. and abroad. More than 1,000 patients per day receive radiotherapy with these machines.

The High Voltage Research Laboratory was organized formally in 1946 as a part of the M.I.T. Department of Electrical Engineering and was housed in a small building on M.I.T.'s North Campus. The collaboration with physicians of the Lahey Clinic and the treatment of Clinic patients at the M.I.T. Laboratory began in 1949 using the 2 million volt X-ray generator which is about to be replaced.

Early work by this team emphasized the rotational method of administering X-ray treatments. During treatment the patients are rotated to localize the absorbed X-ray dosage in the tumor region and to minimize the dosage to surrounding intervening healthy tissue. Radiation absorbers, sometimes rotating synchronously with the patient, are also used to shield healthy regions.

The High Voltage Research Laboratory in cooperation with the Lahey Clinic has pioneered in the application of electron beams directly to skin cancers. Ancillary to this work has been the Laboratory's development of techniques to sterilize artery, bone and nerve graft materials by electron radiation for storage and later surgical use. A number of medical centers throughout the U.S. send graft material to the Laboratory for electron sterilization.

The Laboratory also gives training to medical doctors in the use of the therapeutic rays, usually over a period of months during their hospital residencies. Some 50 radiologists from all parts of the world have had such training.

- 30 -

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